CLAIMS

WHAT IS CLAIMED IS:

1. A method of forming an electrolyte, comprising:
removably coupling a perimeter support to a temporary substrate; and
electrodepositing an electrolyte composite film on said temporary substrate.

2. The method of claim 1, wherein said electrolyte composite film comprises a structural material and an electrolyte material.

3. The method of claim 2, wherein said electrolyte material comprises perfluorosulfonate ionomer particles.

4. The method of claim 2, wherein said structural material comprises ceramic particles.

5. The method of claim 1, wherein said perimeter support comprises a gasket.

6. The method of claim 1, wherein said temporary substrate comprises an electrode.

7. The method of claim 6, wherein said electrode comprises a negatively charged electrode.

8. The method of claim 1, wherein said temporary substrate comprises a metallic material.

9. The method of claim 8, wherein said metallic material comprises nickel.

10. The method of claim 8, wherein said metallic material comprises stainless steel.

11. The method of claim 1, wherein removably coupling said perimeter support comprises depositing a release material on said temporary substrate prior to electrodepositing said electrolyte composite film.

12. The method of claim 1, wherein said electrodepositing said film comprises electrophoretic deposition.

13. The method of claim 1, further comprising electrodepositing a layer of ions on said electrolyte composite film.

14. The method of claim 13, wherein said layer of ions comprises at least one of perfluorosulfonate ionomers or sulfonate polyetherketones.

15. The method of claim 13, wherein said electrodepositing of said layer of ions comprises electrolytic deposition.

16. The method of claim 13, wherein electrodepositing said layer of ions seals said electrolyte composite film.

17. The method of claim 13, wherein said electrolyte composite film, said layer of ions and said perimeter support comprise an electrolyte assembly and further comprising removing said electrolyte assembly as an integral unit from said temporary substrate.

18. The method of claim 13, wherein electrodepositing said electrolyte composite film comprises electrophoretic deposition and electrodepositing said layer of ions comprises electrolytic deposition.

19. An electrolyte composite film, comprising:

simultaneously electrodeposited electrolyte particles and structural particles that form a single layer.

20. The electrolyte composite film of claim 19, wherein said electrolyte particles comprise perfluorosulfonate ionomers or sulfonate polyetherketones particles.

21. The electrolyte composite film of claim 20, wherein said structural particles comprise ceramic particles.

22. The electrolyte composite film of claim 19, wherein said particles are positively charged.

23. The electrolyte composite film of claim 22, wherein said particles are electrodeposited by electrophoretic deposition.

24. An electrolyte assembly, comprising:

a perimeter support; and

an electrolyte composite film deposited within a perimeter of said support and coupled thereto.

25. The electrolyte assembly of claim 24, wherein said electrolyte composite film comprises simultaneously electrodeposited electrolyte particles and structural particles that form a single layer.

26. The electrolyte assembly of claim 25, wherein said electrolyte particles comprise perfluorosulfonate ionomers or sulfonate polyetherketones particles.

27. The electrolyte assembly of claim 26, wherein said structural particles comprise ceramic particles.

28. The electrolyte assembly of claim 25, wherein said particles are positively charged.

29. The electrolyte assembly of claim 25, wherein said particles are electrodeposited by electrophoretic deposition.

30. The electrolyte assembly of claim 24, further comprising a layer of ions formed on said electrolyte composite film.

31. The electrolyte assembly of claim 30, wherein said layer of ions seals said electrolyte composite film.

32. The electrolyte assembly of claim 30, wherein said layer of ions comprise perfluorosulfonate ionomers or sulfonate polyetherketones ionomers and said electrolyte composite film comprises higher molecular weight particles.

33. The electrolyte assembly of claim 30, wherein said layer of ions comprises low molecular weight ions and said electrolyte film comprises higher molecular weight particles and said low molecular weight ions and higher molecular weight particles are of substantially the same material.

34. A fuel cell membrane/electrode assembly, comprising:

an electrolyte assembly having an electrolyte composite film sealed by a layer of ions and coupled to a perimeter support;

an anode coupled to a first side of said electrolyte assembly; and

an electrode coupled to a second side

35. The membrane/electrode assembly of claim 34, wherein said electrolyte composite film comprises simultaneously electrodeposited electrolyte particles and structural particles that form a single layer.

36. The membrane/electrode assembly of claim 35, wherein said electrolyte particles comprise perfluorosulfonate ionomers or sulfonate polyetherketones particles.

37. The membrane/electrode assembly of claim 35, wherein said structural particles comprise ceramic particles.

38. The membrane/electrode assembly of claim 35, wherein said particles are positively charged.

39. The membrane/electrode assembly of claim 35, wherein said particles are electrodeposited by electrophoretic deposition.

40. The membrane/electrode assembly of claim 34, wherein said layer of ions seals said electrolyte composite film.

41. The membrane/electrode assembly of claim 34, wherein said layer of ions comprises at least one of perfluorosulfonate ionomers or sulfonate polyetherketones.

42. The membrane/electrode assembly of claim 34, wherein said layer of ions are electrodeposited by electrolytic deposition.

43. A fuel cell system, comprising:

means for conducting ions across an electrochemical system; and

means for reducing shrinkage and swelling of said means for conducting ions across an electrochemical system due to changes in hydration of said means for conducting.

44. The fuel cell system of claim 43, further comprising an anode and a cathode coupled to opposing sides of said means for conducting ions across an electrochemical system.

45. The fuel cell system of claim 43, wherein said means for conducting ions across an electrochemical system comprises an electrolyte composite film.

46. The fuel cell system of claim 43, wherein said electrolyte composite film is formed without heat pressing.

47. A method of forming an electrolyte composite film, comprising:

simultaneously electrodepositing electrolyte particles and structural particles to form a single layer of said electrolyte composite film.

48. The method of claim 47, further comprising:

removably coupling a perimeter support to a temporary substrate; and

depositing said particles on said temporary substrate within said perimeter support.

49. The method of claim 47, wherein said electrolyte material comprises perfluorosulfonate ionomer particles.

50. The method of claim 47, wherein said structural material comprises ceramic particles.

51. The method of claim 48, wherein said perimeter support comprises a gasket.

52. The method of claim 48, wherein said temporary substrate comprises an electrode.